6. ACCIDENT PREVENTION PROGRAM

The WAG 7 routine monitoring activities present primarily physical hazards and very limited potential chemical hazards to personnel conducting tasks. However, scope of routine monitoring work includes not only well-sampling tasks but also more complex and hazardous tasks (e.g., well maintenance and decommissioning) that require more detailed planning and hazard mitigation strategies. It is important that all personnel participating in routine monitoring activities understand and follow the project-specific requirements of this HASP, JSA hazard mitigation and PPE requirements, and applicable work package(s) steps and hold points (where applicable) to control hazards.

Engineering controls, hazard isolation, work practices and training, and the use of PPE will all be implemented to eliminate or mitigate potential hazards and personnel exposures. However, all routine monitoring personnel have responsibilities in the hazard identification and control process. These include:

- Participation in the hazards identification process based on the scope of work
- Participation in the hazard walkdowns of the areas where routine monitoring activities will take place
- Assistance in the completion of hazard screening checklists or hazard profile screening checklists (as applicable)
- Attendance at the prejob briefing and subsequent PODs to ensure all workers have a clear understanding of the scope of work, associated hazards, and mitigation requirements

Note: If the scope of work, hazards identified, hazard mitigation (including PPE requirements) or work control documentation is not clearly understood, personnel will ask the FTL for clarification **before signing the prejob attendance sheet and prior to starting work**.

- Recognition of changing conditions, scope of work, and new hazards requiring mitigation and taking appropriate action to communicate these condition to the FTL, halt activities, or stop work (where appropriate) in accordance with MCP-553, "Stop Work Authority," until new scope or hazards are adequately addressed in work control documents and mitigation is in place.

All field team members must participate in the hazard identification and mitigation process for an accident prevention program to be effective. This process will be ongoing during the course of routine monitoring activities and as additional tasks (scopes of work) are initiated. Feedback to the FTL and communication between workers about routine monitoring lessons learned is critical to ensure tasks are being conducted in the safest and most efficient manner. The daily POD and post-job briefing provide a formal forum for sharing lessons learned and contributing ideas for safer and more efficient ways to do work; however, new ideas and lessons learned should be shared before work is being conducted to be most effective.

6.1 Voluntary Protection Program and Integrated Safety Management

The INEEL safety processes embrace the VPP and ISMS criteria, principles, and concepts as part of operational excellence. All levels of management are responsible for implementing safety policies and programs and for maintaining a safe and healthy work environment. Project personnel and subcontractors are expected to take a proactive role in preventing accidents, ensuring safe working conditions for themselves and fellow personnel, and complying with all work control documents and procedures.

The ISMS is focused on the system side of conducting operations, and VPP concentrates on the people side of conducting work, but both define work scope and identify, analyze, and mitigate hazards. The VPP is a process that promotes and encourages continuous safety improvement; however, it is not a requirement of any regulatory agency. The INEEL and affected subcontractors participate in VPP and integrated safety management for the safety of their employees. Additional information regarding the INEEL VPP and ISMS programs can be found in Program Design Document (PDD) -1005, "Site Operations Manual." The five key elements of VPP and ISMS are:

Voluntary Protection Program	Integrated Safety Management System
Management leadership	Define work scope
Employee involvement	Analyze hazards
Worksite analysis	Develop and implement controls
Hazard prevention and control	Perform work within controls
Safety and health training	Provide feedback and improvement

6.2 General Safe-Work Practices

The following practices are mandatory for all INEEL and subcontractor personnel working on WAG 7 routine monitoring sites. All site visitors entering designated or controlled work areas must follow these practices. The FTL and HSO are responsible for ensuring these hazard control practices are followed at the site.

Note: Failure to follow these practices may result in permanent removal from the site and other disciplinary actions.

- Access into designated or controlled work areas will be limited to authorized INEEL, subcontractor, and visitor personnel only.
- DO NOT enter controlled work areas or areas posted with DANGER signs unless authorized by the FTL.
- Comply with all safety signs, color codes, and barriers and DO NOT cross safety or radiological barriers unless you understand the hazard within and have the proper training to access the area. Adhere to PRD-5117, "Accident Prevention Signs, Tags, Barriers, and Color Codes."
- Absolutely no eating, drinking, chewing gum or tobacco, smoking, applying cosmetics, or participating in any other practice that increases the probability of hand-to-mouth transfer and ingestion of materials will be allowed except in designated eating or break areas.
- Wear all prescribed personal protective equipment (minimum of Level D) and comply with MCP-2716, "Personal Protective Equipment" requirements.
- Be aware of walking and working surface conditions (i.e., wet, snow, mud, frost, ice covered), apply sand or salt (where appropriate), and wear adequate footwear to prevent slips and falls.
- Do not wear finger rings, loose clothing, wristwatches, and other loose accessories when within arm's reach of moving machinery.

- Report unsafe equipment, defective or frayed electrical cords, and unguarded machinery to the FTL or HSO.

- Ground-fault protection will be provided whenever electrical equipment is used outdoors.

- Project personnel will ensure that electrical equipment, wiring, cables, switches, and current overload protection devices meet applicable regulations and are maintained in a manner that provides protection for project personnel from shock hazards and injury, and prevents property damage in accordance with MCP-3650, "Chapter IX Level I Lockouts and Tagouts;" MCP-3651, "Chapter IX Level II Lockouts and Tagouts;" and RWMC supplements.

- Keep all ignition sources at least 15 m (50 ft) from explosive or flammable environments and use nonsparking, explosion-proof equipment (if advised to do so by a safety professional).

- Be alert for dangerous situations, strong or irritating odors, or airborne dust or vapors, and report all potentially dangerous situations to the FTL.

- Check weather forecasts and be alert to changing weather conditions that could present hazards to personnel (e.g., lightning, high winds, and winter storms).

- Be familiar with, understand, and follow project emergency procedures (see Section 11).

- Be familiar with the physical characteristics of the task site, including but not limited to the following:

  - Wind direction
  - Accessibility of fellow personnel, equipment, and vehicles
  - Entry and exit routes from the weather structure
  - Communications at the task site and with the RWMC shift supervisor
  - Major roads and means of access to and from the cold test pit south and north sites
  - Nearest water sources and fire fighting equipment
  - All RWMC and project warning devices and alarms
  - Capabilities and location of RWMC incident response team and INEEL fire department.

- Prevent releases of hazardous materials including those used at the task site. If a spill occurs, try to isolate the source (if possible and it does not create a greater exposure potential) and then report it to the FTL. The RWMC shift supervisor will be notified and additional actions taken as described in Section 11. Appropriate spill response kits or other confinement and absorbent materials will be maintained at the task site

- Report all broken skin or open wounds to the HSO or FTL. The OMP physician will consider how the wound can be bandaged and will recommend PPE to be worn by the injured employee.

Note: Personnel with unprotected wounds will not be permitted to enter the controlled work area without proper bandaging.

- Personnel working in the controlled work area will implement the "buddy system" (see Subsection 6.5)

- All personnel have the authority to initiate **STOP WORK** actions in accordance with MCP-553.

6.3 As Low as Reasonably Achievable Principles

Groundwater monitoring data (see Section 8) from existing WAG 7 wells, lysimeters, and purge water have demonstrated that radionuclide levels are in the picocurie per liter (pCi/L) range and that radiological contamination from groundwater at these sites presents only a minimal radiological exposure hazard (external or contamination). Based on this minimal hazard potential, as low as reasonably achievable (ALARA) principles will be followed where the potential exists for contact with water with trace radionuclide contaminants (at well as lysimeter locations inside the RWMC facility).

Radiological contamination monitoring will be conducted at specific WAG 7 locations during routine monitoring tasks based on previous groundwater radionuclide sampling data and based on the potential for encountering contamination during maintenance and decommissioning tasks, as specified in technical procedures and as deemed appropriate by RWMC radiation control (RADCON) personnel. If contamination is detected at levels that alert personnel to changing conditions (e.g., above background or RWP limits, if written), personnel will isolate potentially contaminated equipment or surfaces and halt activities until adequate controls can be implemented.

All radiation exposure to project personnel will be controlled such that radiation exposures are well below regulatory limits and that there is no radiation exposure without commensurate benefit. Unplanned and preventable exposures are considered unacceptable. The goal is to eliminate or minimize radiation exposures and all project personnel have the responsibility to follow ALARA principles and practices. Personnel working at the site will strive to keep both external and internal radiation doses ALARA by adopting the practices described below.

6.3.1 External Radiation Dose Reduction

Basic protective measures used to reduce external doses of radiation include the following items:

- Minimizing time in radiation areas

- Maximizing the distance from known sources of radiation

- Using radiation protection shielding.

Personnel will adhere to all radiological postings in the SDA, wear required dosimetry, and contact an RCT if contamination is suspected of being encountered during any routine monitoring task. An RWP may be written for specific routine monitoring maintenance, decommissioning or abandonment operations as deemed appropriate by RADCON personnel and in accordance with MCP-7, "Radiological Work Permit."

6.3.2 Internal Radiation Dose Reduction

An internal dose of radiation is a result of radioactive material being taken into the body. Radioactive material can enter the body through inhalation, ingestion, absorption through wounds, or injection from a puncture wound. Reducing the potential for radioactive material to enter the body is critical to avoiding internal doses of radiation. Monitoring for contamination will be conducted using hand-held instruments and in accordance with MCP-357, "Job-Specific Air Sampling/Monitoring," and as deemed appropriate by RWMC RADCON personnel and as specified in applicable RWPs.

6.4 Chemical Contaminant Exposure Avoidance

Groundwater monitoring data (see Section 8) from existing WAG 7 wells, lysimeters, and purge water have demonstrated that chemical contaminant levels are in the microgram per liter (μg/L) range. Based on the water matrix these contaminants are in and the minimal exposure time for personnel conducting sampling and handling tasks, the potential for approaching health-based exposure limits (i.e., PELs or TLVs) is considered minimal to negligible.

Other sources for chemical exposure include:

- Acids used to preserve water samples
- Potential trace contaminants in the SDA overburden that may be encountered during well abandonment tasks
- Fuels used for generators and powered equipment
- Bentonite, cement, and concrete used during abandonment tasks
- Small amounts of petroleum-based lubricants that may be used during maintenance tasks.

Some of these contaminants may pose a contact hazard from skin, mucous-membrane, or eye contact and the implementation of avoidance practices in conjunction with PPE usage will serve to minimize the potential for exposures. Some methods of exposure avoidance include:

- Isolating known sources of contamination through the use of engineering controls or barriers
- Using laboratory hood for acid handling and sample preservation tasks
- Wearing all required PPE, when required, and inspecting all pieces and taping all seams before donning
- Donning and doffing PPE following radiological protocols if additional outer protective clothing is required
- Washing hands, face, and other exposed body surfaces before eating, drinking, smoking, or participating in other activities that may provide a pathway for contaminants.

6.5 The Buddy System

The two-person or buddy system will be used at routine monitoring sites when a controlled work

area has been established as required by the RWMC shift supervisor, and in accordance with MCP-2725, "Field Work at the INEEL." The buddy system requires workers to assess and monitor their buddy's mental and physical well being during the course of the workday. A buddy must be able to:

- Provide assistance
- Verify the integrity of PPE (when required)
- Observe partner for signs and symptoms of heat stress, cold stress, or contaminant exposure
- Notify other personnel in the controlled work area if emergency assistance is needed.

Workers need to be able to see or hear and effectively communicate with their buddy at all times when in the controlled work area.

7. SITE CONTROL AND SECURITY

Site control and security will be maintained at WAG 7 routine monitoring locations during operational activities to prevent unauthorized personnel from entering the work area. Entry into and exit out of these areas will be controlled through the appropriate use of barriers, signs, and other measures in accordance with PRD-5117.

Based on the nature of the routine monitoring tasks to be completed, a graded approach with two types of site-control designations will be used based on the potential hazards, complexity of work tasks, and duration of sampling events. The two types of work areas are:

- Designated work areas that are established for low-hazard routine monitoring and maintenance tasks at well and lysimeter locations
- Controlled work areas (CWA) that are established for higher-hazard maintenance, decommissioning, and abandonment tasks.

The primary differences between the types of work areas will be the size of the area, method of delineation, and postings as determined by the operations being conducted and associated hazards. The determination of what type of work area will be established will be made by the HSO in conjunction with the FTL and RWMC RADCON personnel (where radiological concerns exist).

Personnel not directly involved with routine monitoring activities will be excluded from entering these work areas. Visitors may be admitted into work areas provided they are (1) on official business, (2) authorized by the FTL, and (3) have met all the site-specific training requirements for the area they have a demonstrated need to access (as listed on Table 4-1).

Note: Visitors may not be allowed into controlled work areas during certain maintenance, decommissioning, or abandonment tasks to minimize risks to workers and visitors. The determination as to any visitor's need for access into the controlled work area will be made by the FTL in consultation with the HSO and RADCON (as appropriate).

Figures 7-1 and 7-2 illustrate examples of a DWA and CWA, respectively. These figures represent the general configuration of the work areas and are not intended to provide an exact layout, position of equipment, or scale. Changing field conditions and industrial hygiene or RADCON monitoring may warrant reconfiguring the layout, size, designation, and orientation of these work areas. Additionally, entrance and egress points may change based on these same factors. Changes, additions, or elimination of areas will be the decision of the FTL in conjunction with the HSO, RADCON (as appropriate), safety professional, and IH based on monitoring data and the nature of the activities taking place.

All potential safety, chemical, and radiological hazards will be evaluated when delineating each work area location and size. Barriers (e.g., rope, cones, and printed ribbon) will be used for delineation and demarcation. Where warranted, designated traffic routes also may be established. These areas also will be posted to prevent inadvertent entry by unauthorized personnel.

Note: The safety professional and IH will assist the HSO in establishing the access requirements for the truck-traffic routes and designated work areas and for the project-based equipment in use.

7.1 Designated Work Area

The DWAs established for routine monitoring tasks will consist of the area immediately around the well being monitored and an area large enough to encompass associated field measurement and sampling

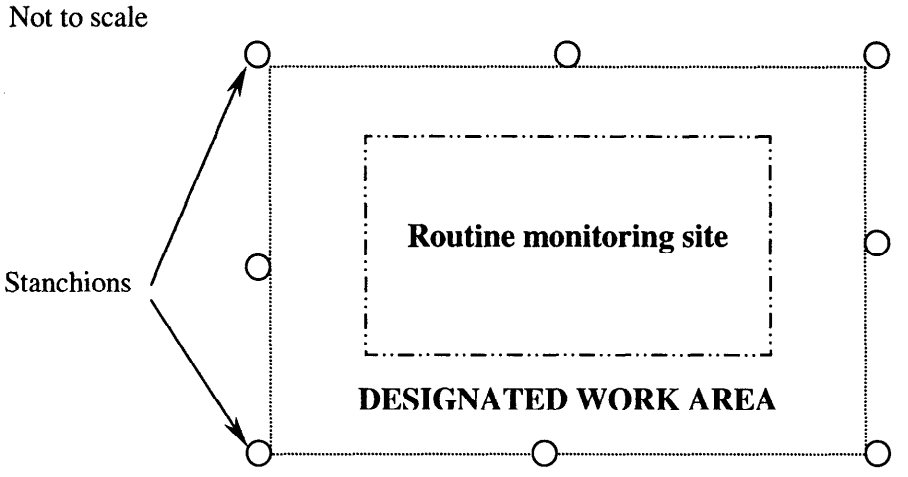

Figure 7-1. Example configuration for a routine monitoring designated work area.

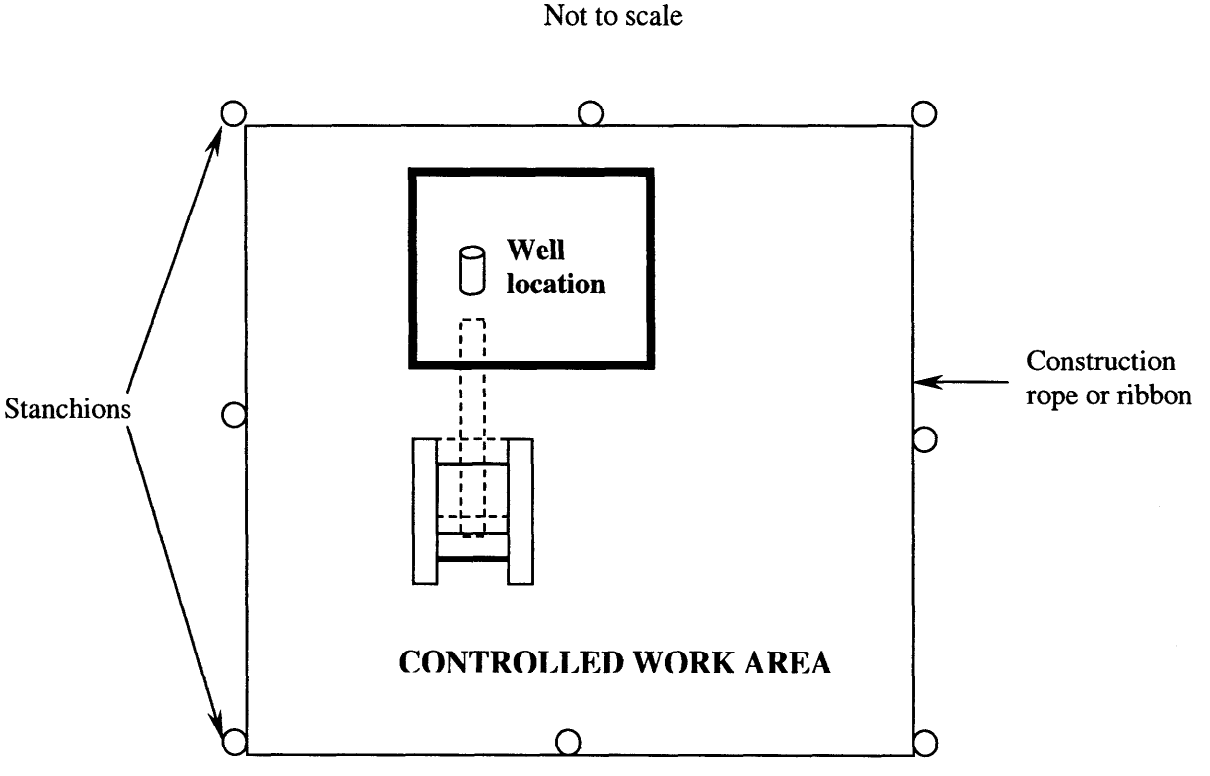

Figure 7-2. Example configuration for a routine monitoring controlled work area.

sampling equipment. This type of work area will be established where a more restrictive designated work area would not lend itself to low-hazard routine monitoring, measurement, or maintenance tasks of short duration. The boundary of the DWA will typically be marked with cones or stanchions and generally will not be delineated with rope or ribbon or include other demarcation. All personnel who enter the DWA will wear the appropriate level of PPE for the degree and type of hazards present, as listed in Section 9

Support facilities (e.g., project administrative trailer, vehicle parking, additional emergency equipment, extra PPE, and stored monitoring and sampling equipment) will generally be located outside the designated work area. Visitors who do not have appropriate training to access the designated work area will be restricted from entering this area during routine monitoring operations.

7.2 Controlled Work Area

The CWAs will be large enough to encompass the equipment and nature of the tasks being conducted to prevent personnel not assigned to the project task and visitors from being exposed to potential safety and health hazards associated with the routine monitoring tasks. This type of work area will be established where a more restrictive area is required based on increased hazards associated with routine monitoring maintenance, decommissioning, or abandonment tasks. The boundary of the CWA will typically be marked with a combination of stanchions or posts and delineated with rope or ribbon and include warning signs (e.g., construction area) or other demarcation. Only the minimum number of personnel required to safely perform the project tasks will be allowed into the CWA. The CWA is controlled during all routine monitoring operations and an entry and exit point will be established at the periphery of the CWA to regulate the flow of personnel and equipment. All personnel who enter the CWA will wear the appropriate level of PPE for the degree and type of hazards present, as listed in Section 9.

Factors that will be considered when establishing the CWA boundary include (1) air monitoring data, (2) equipment in use, and (3) the physical area necessary to conduct site operations. The boundary may be expanded or contracted, as this information becomes available, based on the aforementioned evaluations. The HSO, in conjunction with the safety professional and IH, will establish the CWAs. All CWAs will be delineated and posted with the appropriate signage based on the hazard being controlled.

7.3 Truck-Traffic Routes

If determined to be required based on project activities, truck-traffic routes may be established for trucks entering the CWA. These routes will include a turnaround area (where feasible) and may be delineated with cones or equivalent markers if an existing roadway does not exist. All drivers will be instructed to use these traffic routes when entering and leaving the CWA and workers will be restricted from entering this area when truck or equipment traffic is using the routes.

7.4 Site Security

All WAG 7 routine monitoring project sites will be secured and controlled during operational times as described in the previous sections including sites located inside and outside the RWMC facility. During off-hours and weekends, locations inside the RWMC are controlled by the normal RWMC facility security access requirements. Locations outside the RWMC facility generally will not require securing during nonoperational times unless the site is left in a configuration that continues to be worked (e.g., CWA with heavy equipment left in the area or well components exposed). Under these circumstances, CWA rope boundaries and postings will be left in place during off-hours and weekends to prevent personnel from inadvertently entering the CWA.

The FTL has the primary responsibility for ensuring the CWA is secured. The HSO and RADCON (where required) will ensure that all health and safety and radiological postings of the area are intact when leaving the site and will be responsible for maintaining them for the duration of the project. Personnel are trained on site access and control requirements during project-specific HASP training and will not cross roped areas without the proper training and authorization, regardless of whether a sign is in place or not.

Note: Signs are routinely lost as a result of high winds and will be replaced as soon as possible the next working day following discovery.

7.5 Wash Facilities and Designated Eating Areas

Ingestion of hazardous substances is possible when workers do not practice good personal hygiene habits. It is important to wash hands, face, and other exposed skin thoroughly after completion of work and before smoking, eating, drinking, and chewing gum or tobacco. For project personnel, the WMF-657 field trailer or RWMC WMF-637 cafeteria will serve as the designated eating area. Wash facilities are located in both buildings.

7.6 Designated Smoking Area

Smoking will only be permitted in designated RWMC smoking areas (e.g., areas with a fire extinguisher and smoking receptacle) and personnel will comply with all INEEL smoking polices including disposing of smoking materials in the proper receptacle. Smoking will not be permitted outside the RWMC facility without establishing a designated smoking area. The project safety professional will be the single point of contact for establishing any smoking area outside the RWMC and such areas may not be permitted at certain times of the year because of high or extreme fire danger.

8. HAZARD ASSESSMENT

The overall objectives of this hazard assessment section are to provide guidance on the following:

- Evaluation of all routine monitoring tasks to determine the extent that radiological, chemical, and physical hazards may potentially impact site personnel by all routes of entry
- Establishment of the necessary personnel and area monitoring required to evaluate exposure, determine adequate action levels to mitigate potential exposures, and provide specific actions to be followed if action levels are reached
- Determination of engineering controls, isolation methods, work practices to limit personnel exposure, administrative controls, and appropriate respiratory protection and protective clothing to protect site personnel from hazards.

8.1 Waste Area Group 7 Routine Monitoring Activities

Personnel will be exposed to potential safety and physical hazards and limited chemical and radiological hazards while conducting WAG 7 routine monitoring tasks. The magnitude of these hazards related to the specific nature of the tasks being conducted and the relative location of the worker to the potential hazard. In general, well maintenance, decommissioning, and abandonment activities will present greater hazards to personnel than routine sampling tasks. Engineering controls will be implemented (whenever possible), along with work practice controls, use of technical procedures and work orders, real-time monitoring, administrative controls, and site-specific hazard training to further identify and mitigate potential exposures and hazards.

Several tables are presented to identify the potential chemical and radiological concentrations based on past monitoring. Physical hazards that may be encountered, as well as monitoring methods, action limits, and other hazard-specific mitigation measures are also addressed. These tables include the following:

- Table 8-1 lists the radionuclide concentrations from past WAG 7 routine monitoring tasks
- Table 8-2 lists the chemical constituents and concentrations from past WAG 7 routine monitoring tasks
- Table 8-3 presents an evaluation of these chemicals and other radiological hazards that likely will be used during routine monitoring tasks with respect to potential routes of exposure, symptoms of overexposure, and the qualitative exposure risk potential based on the chemical nature of these materials and project tasks
- Table 8-4 summarizes primary routine monitoring tasks, associated hazards, and mitigation
- Table 8-5 lists the hazards that may be monitored by IHs during routine monitoring activities
- Table 8-6 lists industrial hygiene equipment available for monitoring chemical hazards
- Table 8-7 presents action levels and associated responses for specific hazards.

Table 8-1. Radionuclide concentrations from past Waste Area Group 7 routine monitoring tasks.[a]

Radionuclide or Analysis	Release Limit[b]	Average Concentration[c] (pCi/L)	Maximum Concentration[c] (pCi/L)
Gross alpha	15	0.94	4.13 (Well M14S, July1999)
Gross beta	50	4.21	21.3 (Well MD4, March 2000)
Tritium	20,000	579	1,860 (Well M14S, March 2000)

a. Routine monitoring tasks are in accordance with the *Field Sampling Plan for Groundwater Monitoring of Operable Unit 7-13/14* (INEEL 2001b).

b. The value is either an established maximum contaminant level or a proposed maximum contaminant level.

c. Based on all quarterly sampling results from April 1999 to March 2000.

pCi/L = picocurie per liter

Table 8-2. Chemical constituent concentrations from past Waste Area Group 7 routine monitoring tasks.[a]

Chemical	Release Limit[b]	Average Concentration[c] (µg/L)	Maximum Concentration[c] (µg/L)
Chloroform	100	0.3	0.5 (Well M7S, April 1999)
1,1,1-Trichloroethane	200	0.65	2.2 (Well M16S, March 2000)
Carbon tetrachloride	5	3.22	8 (Well M7S, October 1999)
Trichloroethene	5	2	3 (Well M7S, October 1999)
Tetrachloroethene	5	0.2	0.3 (Well M7S, April 1999)
Chromium	100	15.75	28.8 (Well M1S, March 2000)
Mercury	2	ND	ND
Nitrate	10,000	774	774 (Well M6S, October 1999)

a. Routine monitoring tasks are in accordance with the *Field Sampling Plan for Groundwater Monitoring of Operable Unit 7-13/14* (INEEL 2001b).

b. The value is either an established maximum contaminant level or a proposed maximum contaminant level.

c. Based on all quarterly sampling results from April 1999 to March 2000.

Key:

µg/L = microgram per liter ND = none detected

Table 8-3. Evaluation of chemical and radiological hazards at Waste Area Group 7 routine monitoring locations.

Waste Area Group 7 Chemical or Hazardous Material (CAS #)	Exposure Limit[a] (Permissible Exposure Limit or Threshold-Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)[c]	Exposure Potential[d] (Regardless of Personal Protective Equipment)
Project Chemicals or Compounds Brought to the Site						
Bentonite (sodium bentonite) 7631-86-9	10 mg/m^3 (inert nuisance dust)	Inhalation and contact hazard	Mucous membrane and respiratory tract irritation.	Lungs	No	**Moderate to high potential** (used for well completion)
Silica, crystalline – quartz (cement) (14808-60-7)	TLV - 0. 05 mg/m^3 (respirable fraction) OSHA PEL (Respirable) TWA 10 $mg/m^3/(\%SiO_2 + 2)$ Quartz (total dust): TWA 30 $mg/m^3/(\%SiO_2 + 2)$	Inhalation and contact hazard	Pulmonary fibrosis, silicosis	Respiratory	ACGIH - A2	**Low potential** Used for well completion.
Nitric acid (7697-37-2) Vapor density -2 to 3 11.95 eV	ACGIH 2000 TLV—2 ppm STEL—4 ppm OSHA PEL-TWA—2 ppm	Inhalation, ingestion, and contact hazard	Irritation eyes, skin, mucous membrane; delayed pulmonary edema, pneumonitis, bronchitis; dental erosion	Eyes, skin, respiratory system, teeth	No	**Low potential** Used for water sample preservation. Pipettes will be used to deliver acid to sample container.
Sulfuric acid (7664-93-9)	ACGIH TLV — 1 mg/m^3 STEL— 3 mg/m^3 OSHA PEL-TWA 1 mg/m^3	Inhalation, ingestion, and contact hazard	Irritation eyes, skin, nose, throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatis; dental erosion; eye, skin burns; dermatitis.	Eyes, skin, respiratory system, teeth	ACGIH A2 (as mist)	**Low potential** Used for water sample preservation. Pipettes will be used to deliver acid to sample container.

Table 8-3. (continued).

Waste Area Group 7 Chemical or Hazardous Material (CAS #)	Exposure Limit[a] (Permissible Exposure Limit or Threshold-Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)[c]	Exposure Potential[d] (Regardless of Personal Protective Equipment)
CO (630-08-0) Portable gasoline or diesel equipment	TLV - 25 ppm OSHA TWA – 50 ppm	Inhalation	Headache, tachypnea, nausea, lassitude (weakness, exhaustion), dizziness, confusion, hallucinations; cyanosis; depressed S-T segment of electrocardiogram, angina, syncope.	Cardiovascular system, lungs, blood, CNS	No	**Low potential** Equipment Will be operated outdoors
Diesel exhaust	TLV- 0.05 mg/m^3 (particulate aerodynamic diameter < 1 µm (ACGIH 2000 notice of intended changes)	Inhalation	Respiratory irritation, nose, throat or lungs, with stinging and redness of the eyes, headache, nausea, dizziness, unconsciousness.	Respiratory system	ACGIH – A2	**Low potential** Equipment will be operated outdoors
Diesel fuel (8008-20-6) VD->1	TLV 100 mg/m^3 (ACGIH 2001 notice of intended changes)	Inhalation, skin absorption, and contact hazard	Eyes irritation, respiratory system changes, dermatitis.	Eye, respiratory system	No	**Low to moderate potential** Will be used to refuel equipment
NO_x (nitrogen oxides) (Incomplete combustion byproduct) – portable operating equipment	TLV – 3 ppm (NO_2) STEL – 5 ppm OSHA C – 5 ppm (NO_2)	Inhalation	Irritation eyes, nose, throat; cough, mucoid frothy sputum, decreased pulmonary function, chronic bronchitis, dyspnea (breathing difficulty); chest pain; pulmonary edema, cyanosis, tachypnea, tachycardia.	Eyes, respiratory system, cardiovascular system	No	**Low potential** Equipment will be operated outdoors

Table 8-3. (continued).

Waste Area Group 7 Chemical or Hazardous Material (CAS #)	Exposure Limit[a] (Permissible Exposure Limit or Threshold-Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)[c]	Exposure Potential[d] (Regardless of Personal Protective Equipment)
Groundwater Contaminants						
Cadmium (7440-43-9) Vapor density—NA	TLV—0.01 mg/m^3 inhalable fraction TLV—0.002 mg/m^3 respirable fraction PEL—0.005 mg/m^3 (29 CFR 1910.1027)	Inhalation and ingestion hazard	Respiratory, nervous system, irritation of mucous membranes, dryness of mouth, headache.	Kidneys and respiratory tract, blood, prostate	A2—ACGIH Yes—NTP Yes—IARC Yes—OSHA	**Low potential** Trace source term in groundwater samples
Mercury (7439-93-2) VD-1.01	TLV—0.025 mg/m^3	Skin absorption and inhalation hazard	Coughing, chest pain, respiratory distress, salivation, diarrhea, depression, irritability.	Skin, eyes, respiratory central nervous system, kidneys	No	**Low to negligible potential** Trace source term may be encountered in groundwater
Carbon tetrachloride (56-23-5) Vapor density-5.3 Ionization energy-11.5 eV	TLV—5 ppm STEL—10 ppm OSHA ceiling—63 ppm	Inhalation, ingestion, skin absorption, and contact hazard	Nervous system, eyes, respiratory; irritation of eyes and skin, central nervous system, depression, headache.	Central nervous system, eyes, liver, lungs, kidneys	A2—ACGIH Yes—NTP Yes—IARC No—OSHA	**Low potential** Trace source term in groundwater samples
Tetrachloroethene (127-18-4) Vapor density - 5.8 Ionization energy - 9.3 eV	TLV—25 ppm STEL—100 ppm	Inhalation, ingestion, contact hazard	Nervous system, respiratory, headache, loss of consciousness, dermis.	Liver, kidneys, eyes, upper respiratory, central nervous system	No	**Low potential** Trace source term in groundwater samples
1,1,1-Trichloroethane (71-55-6) Vapor density - 4.6 Ionization energy - 11.1 eV	TLV—350 ppm STEL—450 ppm Ceiling—2,460 ppm	Inhalation, ingestion, skin absorption, and contact hazard	Nervous system, dermis, respiratory, eyes, central nervous system depression, headache.	Central nervous system, skin, eyes, cardiovascular system	No	**Low potential** Trace source term in groundwater samples
Trichloroethene (79-01-6) Vapor density - 4.53 Ionization energy - 9.5 eV	TLV—50 ppm STEL—100 ppm Ceiling—537 ppm	Inhalation, ingestion, contact hazard	Nervous system, headache, respiratory, eyes, pulmonary edema.	Respiratory, heart, liver, kidneys, central nervous system	No	**Low potential** Trace source term in groundwater samples

Table 8-3. (continued).

Waste Area Group 7 Chemical or Hazardous Material (CAS #)	Exposure Limit[a] (Permissible Exposure Limit or Threshold-Limit Value)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and Systems	Carcinogen (Source)[c]	Exposure Potential[d] (Regardless of Personal Protective Equipment)
Radionuclides—Gross Alpha, Gross Beta, Tritium						
Radionuclides (whole body exposure)	INEEL— 1.5 rem/year project ALARA dose limit, in accordance with RWP or ALARA task Posting of radiation areas in accordance with INEEL RCM, Table 2-3	Whole body	Electronic dosimetry will be used to alert workers to increased gamma radiation fields. Albedo dosimetry and neutron radiation detection instruments will be used to monitor for neutron radiation.	Blood forming cells, GI tract, and rapidly dividing cells	Yes	**Low to negligible Potential** Trace source term in groundwater samples
Radionuclides (fixed and removable surface contamination)	Posting of CAS# in accordance with INEEL RCM, Table 2-4, § 835.404.c, and § 835.603.f	Ingestion and contact hazard	Alarming personnel contamination monitors and hand-held instruments (see Table 8-6).	GI tract, ionization of internal tissue	Yes	**Low potential** Trace source term in groundwater samples

a. American Conference of Governmental Industrial Hygienists (ACGIH) 2001 TLV Booklet and OSHA 29 CFR 1910 substance-specific standards.

b. Nervous system: dizziness, nausea, and lightheadedness. Dermis: rashes, itching, and redness. Respiratory: respiratory effects. Eyes: tearing and irritation.

c. If yes, identify agency and appropriate designation (ACGIH A1 or A2; NIOSH; OSHA; IARC, NTP).

Key:

ALARA = as low as reasonably achievable
C = ceiling value
CNS = central nervous system
CVS = cardiovascular system
GI = gastrointestinal
IARC = International Agency for Research on Cancer
INEEL = Idaho National Engineering and Environmental Laboratory
NTP = National Toxicology Program
NIOSH = National Institute of Occupational Safety and Health
OSHA = Occupational Safety and Health Administration
PEL = permissible exposure limit
RCM = Companywide Manual 15A, *Radiological Control*
RWP = radiological work permit
STEL = short-term exposure limit
TLV = threshold limit value
TWA time-weighted average
VD = vapor density (Air = 1)

Material safety data sheets for these chemicals are available at the project site.

Table 8-4. Waste Area Group 7 routine monitoring tasks, associated hazards, and mitigation.

Tasks	Potential Hazards and Hazardous Agents	Hazard Elimination, Isolation, or Mitigation
• Site preparation • Groundwater and lysimeter sampling • Groundwater field measurements • Sample preservation • Well surface maintenance and construction • Internal well component maintenance and change out • Well component decommissioning • Well abandonment	1. Contact or exposure to chemicals at the task site—Direct contact with water sample preservation acids, contact with cement (high pH), bentonite, fuels, lubricants, dust, CO and NO_x, and trace metals or chemicals in groundwater. 2. Pinch points, caught-between, struck-by, and overhead hazards—Well-component assembly and placement, vehicle or equipment movement, well construction or abandonment, excavation, crane or boom-truck use, material movement, stacking, or handling. 3. Lifting and back strain—Moving equipment and materials, sampling coolers, pumps, well components, and generators. 4. Tripping hazards, uneven terrain, walking, and working surfaces—Uneven surfaces, wet, muddy, or snow- or ice-covered surfaces, cables, cords, and lines on the ground. 5. Hoisting and rigging—Pulling or positioning pumps and equipment at project site. 6. Heated surfaces, heat, and cold stress—Generator motor and exhaust surfaces, outdoor work, summer and fall temperatures, and PPE usage. 7. Hazards noise levels—Trucks, heavy equipment, compressors, and hand tools. 8. Energy sources—Elevated materials or components; 110 Vac electrical, mechanical, thermal, and potentially compressed air systems.	1. DWA or CWA, MSDS for all chemicals used; PPE to avoid skin contact; acid use in lab hood; CO and NO_x monitoring; IH monitoring, trained fuel handlers, HASP training, and PPE as required. 2. Qualified operators, spotter, backup alarms, DWA, CWA, established truck, traffic lanes (as required), body position awareness, hand, head, body protection, tag lines for hoisting and rigging, work controls. 3. Mechanical lifting and movement devices, proper lifting techniques, two-person lifts (as required); store materials in racks and at waist or chest height (where possible). 4. CWA, identify and mitigate tripping hazards and mark where possible; keep walking and working surfaces clean (where feasible); foot protection entry. 5. CWA, qualified operators, certified rigging, follow PRD-160 requirements, tag lines, and wind restrictions. 6. CWA and restricted areas, identify and communicate known heated surfaces where contact is possible; industrial hygiene monitoring and work-rest or warm-up cycles (as required) for heat and cold tress; proper selection of work clothing or PPE; personnel training. 7. CWA, industrial hygiene sound-level monitoring and dosimetry for source identification; hearing protection devices. 8. CWA and restricted areas, posted and labeled sources; hoisting and rigging standard practices (as stated above) training; isolation of energy source (lockout/tagout) for all maintenance, decommissioning, and abandonment activities; outage or subsurface investigation (as required); PPE.

Key:
CWA = controlled work area DWA = designated work area
IH = industrial hygiene MSDS = material safety data sheet PPE = personal protective equipment

Table 8-5. Waste Area Group 7 routine monitoring project hazards to be monitored.

Tasks	Hazards to be Monitored[a]
• Site preparation • Groundwater and lysimeter sampling • Groundwater field measurements • Sample preservation • Well surface maintenance and construction • Internal well component maintenance and change out • Well component decommissioning • Well abandonment	Hazards noise - heavy equipment, trucks, drill rig CO and NO_x –operations with generators or equipment in areas with poor air movement Dust, total nuisance (respirable) – well surface construction, decommissioning, and abandonment tasks (use of bentonite and excavation tasks) Crystalline silica dust (respirable) – well surface construction and abandonment (use of cement) Noise levels[b] –trucks, heavy equipment, compressors, generator, and other equipment as deemed appropriate Organic compounds – contaminants as listed on Table 8-2 and fueling operations and general operations with potential for exposure to organic hydrocarbons, as deemed appropriate Diesel exhaust – in areas with poor ventilation only, as deemed appropriate.

a. Monitoring and sampling will be conducted (as deemed appropriate by project IH personnel) based on specific tasks, site conditions, and professional judgment.

b. Sound-level meter to be used for instantaneous sound levels and to determine hearing protection requirements. Additional noise dosimetry may be conducted, as deemed appropriate, based on the nature of the sound level sources and duration of exposure or project.

Table 8-6. Equipment available for monitoring Waste Area Group 7 routine monitoring project hazards.

Chemical or Radiological Hazard to be Monitored or Sampled	Equipment and Monitoring and Sampling Method [a,b]	
Petroleum hydrocarbons and distillates Nuisance particulates, NOC Crystalline silica (respirable) Diesel exhaust (respirable)	Personal sampling pumps with appropriate media	Petroleum distillate—NIOSH 1550 Particulates, total nuisance (respirable)—NIOSH 0600 Crystalline silica (respirable)—NIOSH 7500 Diesel exhaust—NIOSH 5040
Petroleum hydrocarbons (VOCs)	FID, PID, or equivalent	
CO, NO_2	MSA-361 or equivalent, with CO and NO_2 cells	
Hazardous noise levels (> 85 dBA for an 8-hour workday, 84 dBA for a 10-hour day, > 140-dBA impact)	ANSI Type S2A sound level meter and ANSI S1.25-1991 dosimeter (A-weighted scale for TWA dosimetry, C-weighted for impact dominant sound environments)	
Heat and cold stress	Heat stress—WBGT, body weight, fluid intake	Cold stress—ambient air temperature, wind chill charts

a. Air sampling will be conducted as deemed appropriate by project IH personnel based on initial direct reading instrument data, routine monitoring operation, and professional judgment.

a. Analytical method will be selected by the IH based on site-specific conditions.

Key:
ANSI = American National Standards Institute
dBA = decibel A-weighted
NIOSH = National Institute of Occupational Safety and Health
NO_2 = nitrogen dioxide
TWA = time-weighted average
WBGT = wet bulb globe temperature
CO = carbon monoxide
FID = flame ionization detector
NOC = not otherwise classified
PID = photoionization detector
VOC = volatile organic compound

Table 8-7. Action levels and associated responses for Waste Area Group 7 routine monitoring project hazards.

Contaminant or Agent Monitored	Action Level	Response Taken if Action Level is Exceeded
Nuisance particulates (NOC)	> 10 mg/m^3 (inhalable fraction) > 3 mg/m^3 (respirable fraction)	Move personnel to upwind position of source. Use wetting or misting methods to minimize dust and particulate matter. IF wetting or misting methods prove ineffective, THEN abandon area being worked OR don respiratory protection[a] (as directed by IH).
Crystalline silica (respirable)	> 0.05 mg/m^3	Move personnel to upwind position of source. Use wetting or misting methods to minimize dust and particulate matter. IF wetting or misting methods prove ineffective, THEN abandon area being worked OR don respiratory protection[a] (as directed by IH).
CO (in poorly ventilated areas)	15 to 25 ppm in workers' breathing zone	Reposition source, monitor near suspected source for elevated levels, ensure personnel are on upwind side of source, and continue to monitor.
	> 25 ppm sustained for 2 minutes in workers' breathing zone	IF > 25 ppm, identify source and leave area until level dissipates below 25 ppm, THEN continuous monitoring. IF levels cannot be kept below 25 ppm, THEN cease operations and contact maintenance personnel to inspect equipment source.[b]
NO2 (in poorly ventilated areas)	1 to 3 ppm in workers' breathing zone	Reposition source, monitor near suspected source for elevated levels, ensure personnel are on upwind side of source, and continue to monitor.
	> 3 but < 5 ppm sustained for 2 minutes in workers' breathing zone	IF > 3 but < 5 ppm, identify source and leave area until level dissipates below 3 ppm, THEN continue monitoring. IF levels cannot be kept below 3 ppm, THEN reposition source downwind and workers upwind, and contact maintenance personnel to inspect equipment source.[b]
	> 5 ppm sustained for 1 minutes in workers' breathing zone	Move personnel unwind of source, shut down equipment when safe to do so, and contact maintenance personnel to inspect equipment source.[b,c]
Diesel exhaust (as elemental carbon)	Note: Elevated CO and NO_2 concentrations should be used as an indication for elevated diesel exhaust concentrations >0.02 mg/m^3 TWA	IF elevated CO and NO_2 concentrations are indicated, THEN, reposition source, monitor near suspected source for elevated levels, ensure personnel are on upwind side of source, and continue to monitor. IF >0.02 TWA, THEN cease operations and contact maintenance personnel to inspect equipment source.[b]

Table 8-7. (continued).

Contaminant or Agent Monitored	Action Level	Response Taken if Action Level is Exceeded	
Hazardous noise levels	< 85 dBA 8-hour TWA, < 84 dBA 10-hour TWA	No action.	
	85 to 114 dBA	Hearing protection required attenuating to below 85 dBA for an 8-hour TWA or 83 dBA for a 10-hour TWA (based device NRR).	
	(a) > 115 dBA (b) > 40 dBA	(a) Isolate source and evaluate NRR for single device. Double protection, as needed.	(b) Control entry, isolate source. Only approved double protection worn.

a. Respiratory protection will be prescribed by the project IH (see Section 9).

b. All equipment must be secured and left in a safe configuration before leaving area.

c. At no time will personnel continue to work in areas with sustained concentrations of NO_2 above 5 ppm (OSHA ceiling value).

Key:

NOC = not otherwise classified	CO = carbon monoxide	dBA = decibel A-weighted
NRR = noise reduction rating	TWA = time-weighted average	NO_2 = nitrogen dioxide

Safe work permits and JSAs may be used in conjunction with this HASP to address specific routine monitoring hazard mitigation. If used, the SWP will augment this HASP and further detail specialized protective equipment and mitigation measures (e.g., hot work).

8.2 Routes of Exposure

Exposure pathways for potential contaminants that may be encountered during routine monitoring activities are directly related to the source of exposure and associated route(s) of entry. Engineering controls, industrial hygiene monitoring, training, and work controls are all intended to mitigate potential exposures and uptake of contaminants; however, the potential still exists for exposure to contaminants that may be encountered.

Exposure pathways include the following:

- Inhalation of vapors from trace contaminants in water samples, preservation acid vapors, or nuisance or silica containing dusts during well surface construction, decommissioning or abandonment tasks. Inhalation of these sources may lead to signs or symptoms described in Table 8-3 for the specific hazard.

- Skin absorption and contact with preservation acids, cement, bentonite dust, or fuel contact (during refueling tasks). Fuel can be absorbed through unprotected skin and acids and cement and bentonite have a corrosive effect on skin, eyes, and mucous membranes resulting in skin irritation or potential absorption through broken skin.

- Ingestion of trace contaminants adsorbed to dust particles or on surfaces resulting in potential uptake of contaminants through the gastrointestinal tract that may result in gastrointestinal (GI) irritation (radionuclides) or deposition to target organs.

- Injection by breaking of the skin while handling equipment or materials or migration through an existing wound resulting in localized irritation, contamination, uptake of soluble contaminants, and deposition of insoluble contaminants.

Monitoring will be conducted to identify sources for potential exposure by all routes or entry and to develop mitigative measures to include engineering controls, hold points, and PPE usage where warranted.

8.3 Environmental and Personnel Monitoring

The potential for exposure to chemical, radiological, physical, and environmental hazards exists from various sources that may be encountered during routine monitoring tasks. Engineering and administrative controls, worker training, and the use of protective equipment will mitigate most of these hazards. Monitoring with direct reading instruments will be conducted where deemed appropriate to provide IH personnel with real-time data to assess the effectiveness of these controls. In addition, designated and controlled work areas will be established to limit access to areas around potential hazards to authorized project personnel only (see Section 7).

8.3.1 Industrial Hygiene Monitoring

Various direct reading instruments and full-period sampling equipment may be utilized to determine the presence of chemical and physical agents and to access environmental conditions. The

frequency and type of sampling and monitoring will be determined by changing site conditions, direct reading instrument results, observation, and professional judgment.

All full- and partial-period airborne contaminant sampling may be conducted, as deemed appropriate by the project IH, based on direct-reading instrument readings and changing site conditions. If conducted, all air sampling will be done using applicable NIOSH or OSHA methods and in conformance to the INEEL Safety and Health Manuals. Risk assessments for site personnel will be conducted according to MCP-153, "Industrial Hygiene Exposure Assessment."

8.3.2 Industrial Hygiene Instrument and Equipment Calibration

All monitoring instruments will be maintained and calibrated in accordance with the manufacturer's recommendations, existing industrial hygiene protocol, and in conformance to the INEEL Safety and Health Manuals. Direct reading instruments will be calibrated, at a minimum, prior to daily use, and more frequently as determined by the project IH.

8.3.3 Exposure Action Limits

Action levels have been established to prevent and mitigate potential personnel exposure to chemical and physical hazards during routine monitoring activities. The project HSO, in conjunction with the IH and safety professional, will evaluate activities each day to identify changes in site-specific conditions. If action levels are reached personnel will take the appropriate actions as listed in Table 8-7.

It is important to understand that the action levels in Table 8-7 are in place to prevent occurrences of established 8-hour time-weighted average (TWA) occupational exposure limits for these chemical compounds from being exceeded. When the associated responses to action levels are followed, an additional safety factor is invoked to further reduce the likelihood that the TWAs will be exceeded. The ceiling value for NO_2 is different from a TWA in that this value should not be exceeded even for short time periods. Therefore, a sustained concentration of NO_2 above 3 ppm measured in the breathing zone of project personnel warrant the immediate actions listed in Table 8-7.

8.4 Physical and Environmental Hazard Evaluation, Control, and Monitoring

The physical and environmental hazards present at this project site and the methods that will be used to monitor and control them are described in this section. It is critical that all personnel are aware and understand the scope of work for each task, associated hazards, the equipment to be used, and the controls that are in place to eliminate or mitigate the hazards.

8.4.1 Physical Hazards

The physical hazards encountered while performing tasks at WAG 7 routine monitoring sites pose the most significant hazard to personnel. Section 6 provides general safe-work practices that must be followed at all times. The following sections describe specific industrial safety hazards and procedures to be followed to eliminate or minimize potential hazards to project personnel.

8.4.1.1 Back Strain. Movement of loaded sample coolers, well components, field measurement equipment, generators, compressors, and other support equipment could result in a back injury or strain. Manual material handling will be minimized through task design and use of mechanical or hydraulic lifts whenever possible and positioning of materials at the best working levels at the well locations. All tasks

involving manual lifting will be evaluated by the project IH in accordance with MCP-2692, "Preventing Ergonomic and Back Disorders."

8.4.1.2 Powered Equipment and Tools. All power equipment and tools will be properly maintained and used by qualified individuals according to the manufacturer's specifications. Program requirements document (PRD)-5101, "Portable Equipment and Handheld Power Tools," will be followed for all work performed with powered equipment. All power tools and equipment used outdoors will be ground-fault protected.

8.4.1.3 Heavy Equipment and Moving Machinery. The hazards associated with the operation of heavy equipment include injury to personnel, equipment damage, or property damage. All heavy equipment will be operated in the manner in which it was intended and according to the manufacturer's instructions. Only authorized personnel will be allowed in the vicinity of operating heavy equipment and should maintain visual communication with the operator. All equipment operators will be qualified to operate the equipment being used. Work-site personnel will comply with MCP-2745, "Heavy Industrial Vehicles," and MCP-2743, "Motor Vehicle Safety." Additional safe practices include the following:

- Only qualified operators will operate heavy equipment.
- All heavy equipment will have backup alarms.
- Personnel will maintain a safe distance from operating equipment and will stay alert for equipment movement. Personnel will avoid placing themselves between fixed objects and operating equipment and equipment pinch points and remain outside of the equipment swing and turning radius.
- Walking directly in back of or to the side of heavy equipment without the operator's knowledge is prohibited. All precautions will have been taken prior to moving heavy equipment.
- While operating heavy equipment in the work area, the equipment operator will maintain communication with a designated person responsible for providing direct voice contact or approved standard hand signals. In addition, all site personnel in the immediate work area will be made aware of the equipment operations.
- Where warranted and established, equipment will utilize established traffic lanes and access ways and will be stored so as not to endanger personnel at any time
- Heavy equipment operators will observe safe clearance distances with overhead power lines during movement and operation.

8.4.1.4 Hoisting and Rigging. A crane or boom truck and associated rigging will be required to position equipment, pull pumps, and likely during decommissioning or abandonment tasks. All hoisting and rigging operations will be accomplished in accordance with the DOE-STD-1090-99, "Hoisting and Rigging," and PRD-160, "Hoisting and Rigging." Some basic requirements include but are not limited to the following:

- Under no circumstances will personnel be permitted under any suspended load
- Tag lines will be used to control the load (unless they create an additional hazard)

- Contact or positioning of a suspended load by hoisting and rigging personnel will be limited to conditions defined in PRD-160
- The swing radius of the load will be cleared and only authorized personnel involved with the lift will be allowed in the CWA during hoisting and rigging tasks
- Crane operators will observe safe clearance distances with overhead power lines during movement and operation.

Depending on the complexity of the lift and determination as to whether it is deemed a critical lift, a lifting sketch or similar rigging plan may be required to be developed for hoisting of particular objects or equipment. Where required, the sketch (or rigging plan) will contain a sketch of the object to be lifted including the lifting points or rigging method, center of gravity, gross weight, and required rigging.

All rigging used will have a current load certification tag (or equivalent) demonstrating operability. All equipment operators will be qualified to operate the specific equipment used. Additionally, for mobile cranes or boom trucks, the operator or designated person will visually inspect items following each day, or prior to use, if the crane has not been in regular service. These items include but are not limited to the following:

- All control mechanisms for maladjustment interfering with proper operation
- Crane hooks and latches for deformation, cracks, and wear
- Hydraulic systems for proper oil level
- Lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leakage
- Hoist ropes for kinking, crushing, birdcaging, and corrosion
- All anti-two-block, two-block warning, and two-block damage prevention systems for proper operation.

Note: The operator or other designated person will examine deficiencies and determine whether they constitute a safety hazard. If deficiencies are found they will be reported to the safety professional and hoisting and rigging operations will not proceed until deficiencies are corrected.

8.4.1.5 Electrical Hazards and Energized Systems. Electrical equipment and tools as well as overhead lines may pose shock or electrocution hazards to personnel. Safety-related work practices including inspections will be employed to prevent electric shock or other injuries resulting from direct or indirect electrical contact. If work on energized systems is necessary, these practices will conform to the facility supplemental requirements in PRD-5099, "Electrical Safety," MCP-3650, or MCP-3651 and Parts I through III of NFPA 70E (NFPA 2000).

All electrical work will be reviewed and completed under the appropriate work controls (e.g., work orders, technical procedures or equivalent subcontractor work controls) and only by qualified personnel. Additionally, any generators used at the project sites will be properly wired and grounded, in accordance with PRD-5099 and 29 CFR 1926, Subpart K, "Electrical Safety." Electrical power tools, equipment, and cords are to be inspected for damage before use. If damaged, they should be tagged and removed from service.

8.4.1.6 Personal Protective Equipment. Wearing PPE will reduce a worker's ability to move freely, see clearly, and hear directions and noise that might indicate a hazard. Also, PPE can increase the risk of heat stress. Work activities at the task site will be modified, as necessary, to ensure that personnel are able to work safely in the required PPE. Work-site personnel will comply with MCP-2716. Project PPE levels for routine monitoring activities are described in Section 9 and listed in Table 9-1.

8.4.1.7 Decontamination. Decontamination of sampling equipment will be required. Section 10 describes decontamination techniques in detail. Personnel will conduct decontamination tasks in accordance with applicable technical procedures or MCPs and wear prescribed PPE. The FTL will provide direction for all equipment decontamination tasks to ensure their effectiveness.

8.4.1.8 Flammable and Combustible Hazards. Flammable or combustible liquids will be used at the task sites for refueling equipment. Diesel fuel used at the task site for fueling the equipment will be safely stored, handled, and used. Portable motorized equipment (e.g., generators and light plants) will be shut off and allowed to cool down in accordance with the manufacturer's operating instructions prior to refueling to minimize the potential for a fuel fire.

Only FM/UL-approved flammable liquid containers, labeled with the content, will be used to store fuel. All fuel containers will be stored at least 15 m (50 ft) from any facilities (e.g., trailers) and ignition sources or stored inside an approved flammable storage cabinet. Additional requirements are provided in MCP-584, "Flammable and Combustible Liquid Storage and Handling." Portable fire extinguishers, with a minimum rating of 10A/60BC will be strategically located at the site to combat Class A, B, and C fires.

The accumulation of combustible materials will be strictly controlled at routine monitoring sites. Disposal of combustible materials will be assessed at the end of each shift. Class A combustibles such as trash, cardboard, rags, wood, and plastic will be properly disposed of in metal receptacles at the RWMC and in appropriate waste containers within the SDA.

8.4.1.9 Project Equipment Fire Hazards. Combustible or ignitable materials in contact with or near exhaust manifolds, catalytic converters, or other ignition sources could result in a fire. The INEEL fire department may have to authorize any hot work to be done if the fire danger at the INEEL is deemed high or extreme. The project safety professional will be contacted to initiate a hot work permit. If a hot work permit is issued, a trained fire watch will be assigned. Fire extinguishers will be positioned in the DWA or CWA on or near site equipment that has exhaust heat sources and all equipment capable of generating ignition (or that has the potential to spark). At least one radio will be required when conducting routine monitoring tasks so emergency communications can be established should the fire department or RWMC incident response team need to be summoned. Section 11 details emergency communications.

8.4.2 Environmental Hazards

Environmental hazards will be encountered during routine monitoring activities based on the nature of the work (outside), locations of the wells, and time of year when these tasks will be conducted (year-round). The following sections provide guidelines for environmental hazard mitigation.

8.4.2.1 Heat Stress. Summer temperatures and the use of PPE that prevents the body from cooling could lead to environmental conditions where heat stress could occur. High ambient air temperatures can result in increased body temperature, heat fatigue, heat exhaustion, or heat stroke that can lead to symptoms ranging from physical discomfort, unconsciousness, to death. Personnel must inform the FTL or HSO when experiencing any signs or symptoms of heat stress or observing a fellow worker experiencing them. Heat stress hazards are further described in Table 8-8 and in MCP-2704, "Heat and Cold Stress."

Table 8-8. Heat stress signs and symptoms.

Heat-Related Illness	Signs and Symptoms	Emergency Care
Heat rash	Red skin rash and reduced sweating	Keep the skin clean, change all clothing daily, and cover affected areas with powder containing cornstarch or with plain cornstarch.
Heat cramps	Severe muscle cramps, exhaustion, sometimes with dizziness or periods of faintness	Move the patient to a nearby cool place and give the patient half-strength electrolytic fluids. If cramps persist, or if more serious signs develop, seek medical attention.
Heat exhaustion	Rapid, shallow breathing; weak pulse; cold, clammy skin; heavy perspiration; total body weakness; dizziness that sometimes leads to unconsciousness	Move the patient to a nearby cool place. Keep the patient at rest, give the patient half-strength electrolytic fluids, treat for shock, and seek medical attention. DO NOT TRY TO ADMINISTER FLUIDS TO AN UNCONSCIOUS PATIENT.
Heat stroke	Deep, then shallow breathing; rapid, strong pulse, then rapid, weak pulse; dry, hot skin; dilated pupils; loss of consciousness (possible coma); seizures or muscular twitching	Cool the patient rapidly. Treat for shock. If cold packs or ice bags are available, wrap them and place one bag or pack under each armpit, behind each knee, one in the groin, one on each wrist and ankle, and one on each side of the neck. Seek medical attention as rapidly as possible. Monitor the patient's vital signs constantly. DO NOT ADMINISTER FLUIDS OF ANY KIND.

Note: Heat exhaustion and heat stroke are extremely serious conditions that can result in death and should be treated as such. Transport individual immediately to the nearest medical facility.

Monitoring for heat stress conditions will be performed according to MCP-2704. Depending on the ambient weather conditions, work conditions, type of PPE worn, and the physical response of work operations personnel, the IH will inform the FTL and HSO of necessary adjustments to the work and rest cycle. Additionally, physiological monitoring may be conducted to determine whether personnel are replenishing liquids fast enough. A supply of cool drinking water will be provided and consumed only in approved areas. Workers may periodically be interviewed by the IH or HSO to ensure that the controls are effective and that excessive heat exposure is not occurring. Workers will be encouraged to monitor their body signs and to take breaks if symptoms of heat stress occur.

Individuals showing any of the symptoms of heat exhaustion listed in Table 8-8 will (1) stop work, (2) exit work area, (3) be decontaminated (as appropriate), (4) remove protective clothing (as applicable), (5) move to sheltered area to rest, (6) be provided cool drinking water, and (7) be monitored by a medic or cardiopulmonary resuscitation (CPR) and first-aid certified employee.

8.4.2.2 Low Temperatures. Exposure to low temperatures will be a factor during routine monitoring activities. Winter conditions, relatively cool ambient temperatures, and wet or windy conditions increase the potential for cold injury to personnel. The project IH and HSO will be responsible for obtaining meteorological information to determine whether additional cold stress administrative controls are required. The hazards and monitoring of cold stress are discussed in MCP-2704. Additional cold weather hazards from working on snow- or ice-covered surfaces exist during fall or winter months.

Slip, fall, and material-handling hazards are increased under these conditions. Every effort must be made to ensure walking surfaces are kept clear of ice. The FTL or HSO should be notified immediately if slip or fall hazards are noted at routine monitoring sites.

8.4.2.3 Inclement Weather Conditions. Routine monitoring activities take place outdoors year-round and inclement weather is to be expected. Inclement or adverse weather conditions (e.g., sustained strong winds 25 mph or greater, electrical storms, winter storms, and heavy precipitation) may develop that pose a threat to personnel conducting routine monitoring tasks. The FTL will be responsible for checking weather reports and communicating this information to field team members. The FTL in consultation with the HSO will evaluate changing weather conditions and determine whether environmental conditions pose unacceptable hazards to personnel or equipment. If required based on changing inclement weather conditions, the FTL will direct field personnel to secure equipment in a safe configuration and seek shelter (commensurate with the weather conditions).

Note: Wind restrictions governing hoisting and rigging activities are provided in PRD-160.

8.4.2.4 Noise. Personnel working at the task site may be exposed to noise levels that exceed 85 decibel A-weighted (dBA) for an 8-hour time-weighted average (TWA) and 83 dBA for a 10-hour TWA from various pieces of equipment in use. The effects of high sound levels (i.e., noise) may include the following:

- Personnel being startled, distracted, or fatigued
- Physical damage to the ear, pain, and temporary or permanent hearing loss
- Interference with communication that would warn of danger.

Noise measurements (using instruments listed in Table 8-6) will be performed by the IH according to MCP-2719, "Controlling and Monitoring Exposure to Noise," to determine whether personnel are above allowable noise exposure levels. A threshold-limit value (TLV) of 85 dBA TWA will be applied to personnel exposed to noise levels over no more than an 8-hour day. This level is based on a 16-hour recovery period in a low-noise environment. If personnel are required to work longer than 8 hours in a hazardous noise environment then the TLV will be adjusted to a lower value. The project IH must be consulted regarding modifications to the 85 dBA for an 8-hour TLV and 84 dBA for a 10-hour TWA value.

Personnel whose noise exposure routinely meets or exceeds the allowable level will be enrolled in the INEEL OMP or appropriate subcontractor hearing conservation program. Personnel working on jobs that have noise exposures greater than 85 dBA (83 dBA for a 10-hour TWA) will be required to wear hearing protection until noise levels have been evaluated, and will continue to wear the hearing protection as specified by the IH until directed otherwise.

8.4.2.5 Biological Hazards. The WAG 7 routine monitoring sites are located in areas that provide habitat for various rodents, insects, and reptiles. Based on biological studies done at the INEEL, indigenous deer mice have been known to carry the Hantavirus. The Hantavirus may be present in the nesting and fecal matter of deer mice. A potential exists for project personnel to disturb nesting or fecal matter during the course of mobilization and intrusive activities, and from material handling tasks in the weather structure. If such materials are disturbed, they can become airborne and create a potential inhalation pathway for the virus. Also, contact and improper removal of these materials may provide additional inhalation exposure risks.

If suspect rodent nesting or excrement material is encountered, the project IH will be notified immediately and no attempt will be made to remove or clean the area. Following an evaluation of the area the IH will provide the necessary guidance for protective equipment, mixing, and application of the disinfecting bleach solution and the proper waste disposal method (see MCP-2750, "Preventing Hantavirus Infection").

Snakes, spiders, ticks, mosquitoes, and insects may also be encountered at the cold test pit sites. Common areas to avoid include material stacking and staging areas, under existing structures (e.g., well surface completion cement pads), under boxes, and other areas that provide shelter for snakes and spiders. Protective clothing will prevent insects from direct contact with personnel; however, repellant may be required during Level D activities. Areas where standing water has accumulated provide breeding grounds for mosquitoes and should be avoided. In cases where large areas of standing water is encountered it may be necessary to pump the water area dry or add a small concentration of nonhazardous surfactant to the water to break the surface tension (i.e., to interrupt the mosquito hatching phases). Consult with the FTL and project environmental coordinator before adding surfactant to standing water areas.

8.4.2.6 Walking and Working Surfaces. Slip, trip, and fall hazards exist from uneven terrain, protruding rocks, holes, well surface completion configurations, and environmental conditions leading to muddy or wet surfaces and snow and ice-covered walking surfaces. Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips, and falls. Where identified or anticipated, personnel will be made aware of existing tripping hazards during the prejob briefing and mitigation steps will be taken to eliminate or minimize slip hazards. Snow- or ice-covered walking surfaces that present a hazard during routine monitoring tasks will be cleared or a combination of sand and salt applied. Additionally, personnel will wear appropriate footwear for the conditions anticipated to be encountered.

8.4.2.7 Excavation, Surface Penetrations, and Outages. Excavation tasks may be required in conjunction with well decommissioning or abandonment. Underground utilities will be identified through the use of a subsurface investigation in accordance with PRD-22, "Excavation and Surface Penetration." A competent person will be designated for all excavation tasks. Definitions are provided below.

In accordance with 29 CFR 1926.32, "Definitions," a competent person for excavation activities means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

The competent person will evaluate excavation process to ensure the proper slope and access requirements are being met and conduct inspections as required by PRD-22. This inspection will include, at a minimum, indications of possible cave-in, water accumulation, failure of any component of protective systems, stability of spoil piles and adjacent structures, and indications of hazardous atmosphere.

Access into any excavation will be limited to authorized personnel only, and only after the excavation has been inspected by the competent person. If the excavation is adjacent to a roadway then barricades will be used to prevent vehicles from entering the area around the excavation.

8.4.3 Confined Spaces

No confined spaces have been identified or are anticipated to be encountered during routine monitoring tasks. If a suspected confined space is encountered and not properly posted it will be treated as a permit-required confined space until a determination is made by an assigned safety or IH professional.

8.5 Other Site Hazards and Inspections

Task-site personnel should continually be alert for potential hazards and immediately inform the FTL or HSO so corrective actions can be taken to eliminate or mitigate the hazard. The HSO and FTL will visually inspect the site to ensure that barriers and signs are being maintained, unsafe conditions are corrected, and debris is not accumulating on the site. These inspections will be conducted in addition to regulatory mandated inspections (as applicable).

Periodic safety inspections will be performed by the FTL (or designee) using an appropriate checklist in accordance with MCP-3449. Additionally, targeted or required self-assessments may be performed in accordance with MCP-8, "Self-Assessments Process for Continuous Improvement." All inspections and assessments will be noted in the FTL logbook. Health and safety professionals present at the task site may at any time recommend changes in work habits to the FTL. However, all changes that may affect the project's written work control documents (i.e., HASP, JSAs, and SWPs) must have concurrence from the appropriate project technical discipline representative onsite and have a document action request prepared as required.